

REMARKS

As a preliminary matter, Applicants note that “[t]he examiner should never regard [a Board] reversal as a challenge to make a new search to uncover other and better references.” MPEP 1214.04. “If the examiner has specific knowledge of the existence of a particular reference or references which indicate nonpatentability of any of the appealed claims as to which the examiner was reversed, he or she should submit the matter to the Technology Center (TC) Director for authorization to reopen prosecution.” *Id.* In the present case, *the Examiner has not indicated that the TC Director has approved the actions taken by the Examiner subsequent to the Board’s decision.* Accordingly, the Examiner’s actions are not believed to be proper. Further, because the present claims are not believed to be obvious and/or anticipated by the newly cited references, *Applicants request that the Examiner obtain the proper approval before proceeding further.*

Additionally, Applicants respectfully disagree with the Examiner’s Response to Arguments finding that claims 45, 47, 49, 66, and 67 are no longer pending pursuant to MPEP 1214.06. Indeed, Applicants note that the Examiner’s reliance on MPEP 1214.06 is believed to be clearly misplaced. The portion of MPEP 1214.06 cited by the Examiner relates to claims that *require* action once prosecution has been closed. For example, MPEP 1214.06 applies to a decision reversing the rejection of generic claims in an application containing claims to nonelected species *not previously acted upon*, and, thus, *requiring* action. In contrast, in the present situation, the Examiner has apparently reopened prosecution voluntarily and has *elected* to pursue additional action. Accordingly, MPEP 1214.06 is not believed to be relevant and Applicants should be allowed to amend and/or add new claims. However, to eliminate any concerns regarding the Board’s decision and to facilitate allowance of the remaining pending claims, Applicants have canceled all of the above claims and added new claims. Applicants further note that the newly added claims are directed to the same subject matter as that set forth in the claims the Examiner admits remain pending in the application. Indeed, these new claims are directed to the same subject matter as the claims in which the Board reversed the Examiner’s rejections.

In the Office Action, the Examiner rejected claims 35, 37-39 and 68. By the present Response, claims 45, 47, 49, 66, and 67 are canceled, and claims 71-75 are added as new. Upon entry of these amendments, claims 35, 37-39, 68 and 71-75 will be pending in the present application and are believed to be in condition for allowance. In view of the foregoing amendments and the following remarks, Applicants respectfully request reconsideration and allowance of all pending claims.

Claim Rejections Under 35 U.S.C. § 102

In the Office Action, the Examiner rejected claims 35 and 37 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,258,626 (hereafter the “Wang reference”). Applicants respectfully traverse this rejection.

Anticipation under 35 U.S.C. § 102 can be found only if a single reference shows exactly what is claimed. *See Titanium Metals Corp. v. Banner*, 227 U.S.P.Q. 773 (Fed. Cir.1985). For a prior art reference to anticipate under 35 U.S.C. § 102, every element of the claimed invention must be identically shown in a single reference. *See In re Bond*, 15 U.S.P.Q.2d 1566 (Fed. Cir.1990). That is, the prior art reference must show the *identical invention “in as complete detail as contained in the ... claim”* to support a *prima facie* case of anticipation. *Richardson v. Suzuki Motor Co.*, 9 U.S.P.Q. 2d 1913, 1920 (Fed. Cir. 1989) (emphasis added). Thus, for anticipation, the cited reference must not only disclose all of the recited features but must also disclose the *part-to-part relationships* between these features. *See Lindermann Maschinenfabrik GMBH v. American Hoist & Derrick*, 221 U.S.P.Q. 481, 486 (Fed. Cir.1984). Accordingly, the Applicants need only point to a single element or claimed relationship not found in the cited reference to demonstrate that the cited reference fails to anticipate the claimed subject matter. A *strict correspondence* between the claimed language and the cited reference must be established for a valid anticipation rejection.

Embodiments of the present technique are directed to semiconductor processing and, more particularly, to a stacked die module and techniques for forming a stacked die module. Application, page 2. Specifically, some embodiments of the present technique are directed to a top-down stacking technique. *See, e.g., id.*, pages 10-12. For example, a first die may be

lifted by a stacking tip, coated on one side with an adhesive, such as a paste or epoxy, and then coupled to a second die via the epoxy. *See, e.g., id.* Thus, a stack of two die may be formed on the stacking tip. *See, e.g., id.* Further, an exposed side of the second die may be coated with the adhesive and coupled to a third die and so forth to build a die stack including multiple die. *See, e.g., id.* Once a complete stack is formed, it may be cured, and an outer die of the stack, such as the second die in a two-die stack, may be coated with a layer of adhesive to facilitate attachment to a substrate. *See, e.g., id.* The first adhesive used to attach each die together in the stack may be different than the second adhesive used to attach the die stack to the substrate. *See, e.g., id.* Indeed, the second adhesive may be curable at a lower temperature than the first adhesive. *See, e.g., id.* For example, the first adhesive may be cured at 400°C and the second adhesive may be cured at 100°C. *See, e.g., id.* This may be desirable because the die stack may be cured prior to attaching the stack to the substrate. *See, e.g., id.* Indeed, as would be understood by one of ordinary skill in the art, if the second adhesive were curable at the same temperature or a higher temperature than the first adhesive, the first adhesive would reflow during curing of the second adhesive. Thus, present embodiments are directed to a first adhesive that is curable at a *higher* temperature than a second adhesive, wherein the first adhesive couples die together in a die stack and the second adhesive couples the die stack to a substrate.

Accordingly, independent claim 35 recites, *inter alia*, “a stack comprising at least two semiconductor die ... coupled together by a first adhesive ... curable at a first temperature; and a substrate coupled to one of the at least two semiconductor die by a *second adhesive* ... curable at a second temperature *lower* than the first temperature.” (Emphasis added).

In contrast to claim 35, the Wang reference fails to disclose “a substrate coupled to one of the at least two semiconductor die by a second adhesive.” The Wang reference discloses that a substrate is coupled to a semiconductor die by *solder joints*. As best seen in FIG. 3 of the Wang reference, “solder joints [112] are used to mechanically and electrically attach the chip 110 to the substrate 120.” Wang, col. 3, lines 60-62. While the Examiner apparently attempted to equate the underfill disclosed in the Wang reference with the second adhesive of claim 35, Applicants assert that the underfill clearly does not function to bond the semiconductor die to the substrate. Office Action, page 3. Rather, the solder joints perform

the function of attaching the die to the substrate in the Wang reference, and the “underfill 114 is formed between the chip 110 and the substrate 120 *for sealing the gap between the solder joints 112.*” Wang, col. 1, lines 24-26 (emphasis added). Therefore, it is clear that the “underfill” is not *adhesive*, and, thus, Applicants assert that the Wang reference does not teach a *second adhesive* which couples the semiconductor die to the substrate. As a result, the Wang reference fails to anticipate claim 35.

Furthermore, even assuming *arguendo* that the underfill could hypothetically be equated to the second adhesive of claim 35, the Wang reference fails to teach that the second adhesive is curable at a *lower* temperature than the first adhesive. Specifically, the Wang reference discloses that the adhesive which couples the semiconductor die together (adhesive layer) cures at the *same* or a *lower* temperature than the underfill. In one embodiment, the Wang reference discloses “that the maximum exothermic temperature of the adhesive layer is about the same as that of the underfill,” such that “the adhesive layer and the underfill may be cured simultaneously.” Wang, col. 5, lines 1-4. In another embodiment, the Wang reference discloses, “it is preferable to choose proper materials to form the adhesive layer and the underfill such that the maximum exothermic temperature of the adhesive layer is lower than that of the underfill. . . . This [means] the adhesive layer can be cured at a lower temperature.” *Id.*, col. 5, lines 8-15. Because the Wang reference teaches selection of adhesive cure temperatures directly contrary to those recited in the present application, the Wang reference fails to anticipate claim 35.

In view of the arguments set forth above, Applicants assert that the Wang reference clearly fails to disclose all of the features recited by independent claim 35. Accordingly, for at least the reasons set forth above, Applicants request that the Examiner withdraw the rejection of independent claim 35 and dependent claim 37.

Claim Rejections Under 35 U.S.C. § 103(a)

In the Office Action, the Examiner rejected claim 68 under 35 U.S.C. § 103(a) as being unpatentable over the Wang reference. The Examiner rejected claims 38 and 39 under 35 U.S.C. § 103(a) as being unpatentable over the Wang reference in view of U.S. Patent No. 6,753,206 (hereinafter the “Huang reference”). Further, the Examiner rejected claims 38, 39

and 68 under 35 U.S.C. § 103(a) as being unpatentable over the Wang reference in view of U.S. Pub. 2003/0102567 (hereinafter the “Eskildsen reference”). Applicants respectfully traverse these rejections.

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 U.S.P.Q. 580 (C.C.P.A. 1974). However, it is not enough to show that all the elements exist in the prior art since a claimed invention composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. *KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). It is important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. *Id.* Specifically, there must be some articulated reasoning with a rational underpinning to support a conclusion of obviousness; a conclusory statement will not suffice. *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Indeed, the factual inquiry determining whether to combine references must be thorough and searching, and it must be based on *objective evidence of record*. See *In re Lee*, 61 U.S.P.Q.2d 1430, 1436 (Fed. Cir. 2002).

Applicants assert that the cited references, whether considered separately or in a hypothetical combination, do not disclose *all* of the claimed features of independent claims 38 and 68. For example, independent claims 38 and 68 both recite that the substrate is coupled to the semiconductor die by a second *adhesive*. Further, each of claims 38 and 68 recite that the second adhesive is curable at a second temperature lower than a first temperature at which a first adhesive is curable. In each of the above rejections, the Examiner relied on the Wang reference for teaching these elements of the claims. However, as discussed above, the Wang reference fails to disclose such features. Further, the secondary references cited by the Examiner fail to obviate the deficiencies of the Wang reference. Accordingly, for at least the reasons noted above with regard to independent claim 35, the Examiner’s rejections under 35 U.S.C. § 103 are believed to be improper.

In view of the arguments set forth above, Applicants request that the Examiner withdraw the rejection of claims 38, 39 and 68, and provide an indication of allowance.

New Claims

In this Response, Applicants add new claims 71-75. These claims are fully supported by the specification and are not believed to be disclosed in the prior art. Similar to claim 35, independent claims 71 and 74 both recite that the substrate is coupled to the semiconductor die by an adhesive. For at least the reasons presented above with regard to independent claim 35, this element of independent claims 71 and 74 is not disclosed in the prior art. Therefore, Applicants respectfully request allowance of independent claims 71 and 74 and their dependent claims.

Conclusion

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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